

## **Descriptions of four new species, redescription of *Paraliparis membranaceus*, and additional data on species of the fish family Liparidae (Pisces, Scorpaeniformes) from the west coast of South America and the Indian Ocean**

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### **Abstract**

Liparids are a cottoid family of more than 350 species distributed worldwide in polar, temperate and deep tropical waters. About 20 species (in six genera) are known from the west coast of South America south of Panama to Tierra del Fuego, and four (in two genera) from the Indian Ocean. This paper describes an additional four species from existing collections: three from Peruvian and Chilean waters (*Paraliparis carlbondi* new species, *Paraliparis skeliphrus* new species, *Notoliparis antonbruuni* new species), and one from the Indian Ocean (*Psednos carolinae* new species). *Paraliparis membranaceus* Günther is redescribed, a range extension and additional descriptive information is reported for *Paraliparis merodontus* Stein, additional descriptive information is provided for *Careproctus pallidus* (Vaillant) and *Psednos steini* Chernova, the known range of *Careproctus longifilis* Garman is extended to Peru from the Gulf of Panama, and a species of *Psednos* similar to *Psednos dentatus* Chernova and Stein is described, but not named.

**Key words:** Chile, Peru, Southeastern Pacific Ocean, Indian Ocean, deep water, Liparidae, *Enantioliparis*, *Paraliparis*, *Notoliparis*, *Careproctus*, *Psednos*, new species

### **Introduction**

Liparids are one of the most speciose families in deep waters of the North Pacific (Mecklenburg *et al.*, 2002), the Southern Ocean (Stein & Andriashev 1990; Andriashev & Stein 1998) and in the Southern Hemisphere (Stein *et al.* 2001; Andriashev 2003). They are relatively rare in South American collections, probably because sampling is uncommon in the deeper waters of the continental slope and abyssal plain where they occur. Deep-water liparids have been described from Russian and German research

cruises to the east coast of South America (Patagonia) (Andriashev 1991a, 1991b), but apparently, no similar cruises have been made to western South America since the 1960s. Examination of previously unidentified specimens in existing collections has recently yielded many new species of liparid fishes (Andriashev 1998a; Chernova 2001; Chernova & Stein 2002). Andriashev (2003) recently reviewed 105 species from the Southern Ocean and adjacent waters and provided keys for their identification, but he was unaware of the specimens described herein, nor was he aware that *Paraliparis membranaceus* Günther 1887 is from Chile. Most of the specimens described in this paper were collected by the “Anton Bruun” between 1964 and 1966. Recent examination of them revealed four new species in three genera: *Paraliparis*, *Notoliparis*, and *Psednos*, and suggests that *Enantioliparis* Vaillant 1888, now considered a junior synonym of *Careproctus*, may be a valid genus. This paper describes *Paraliparis skeliphrus* new species, *Paraliparis carlbondi* new species, and *Notoliparis antonbruuni* new species, all from the west coast of South America, *Psednos carolinae* new species from the south-central Indian Ocean, and redescribes *Paraliparis membranaceus*, expands the description and known distribution of *Paraliparis merodontus* Stein, Melendez, and Kong 1991, presents additional descriptive information for *Psednos steini* Chernova 2001, and extends the known range of *Careproctus longifilis* Garman 1892 to Peru. A specimen of a *Psednos* from off Chile, similar to *Psednos dentatus* Chernova and Stein 2002, is described but not named owing to its poor condition.

## Methods

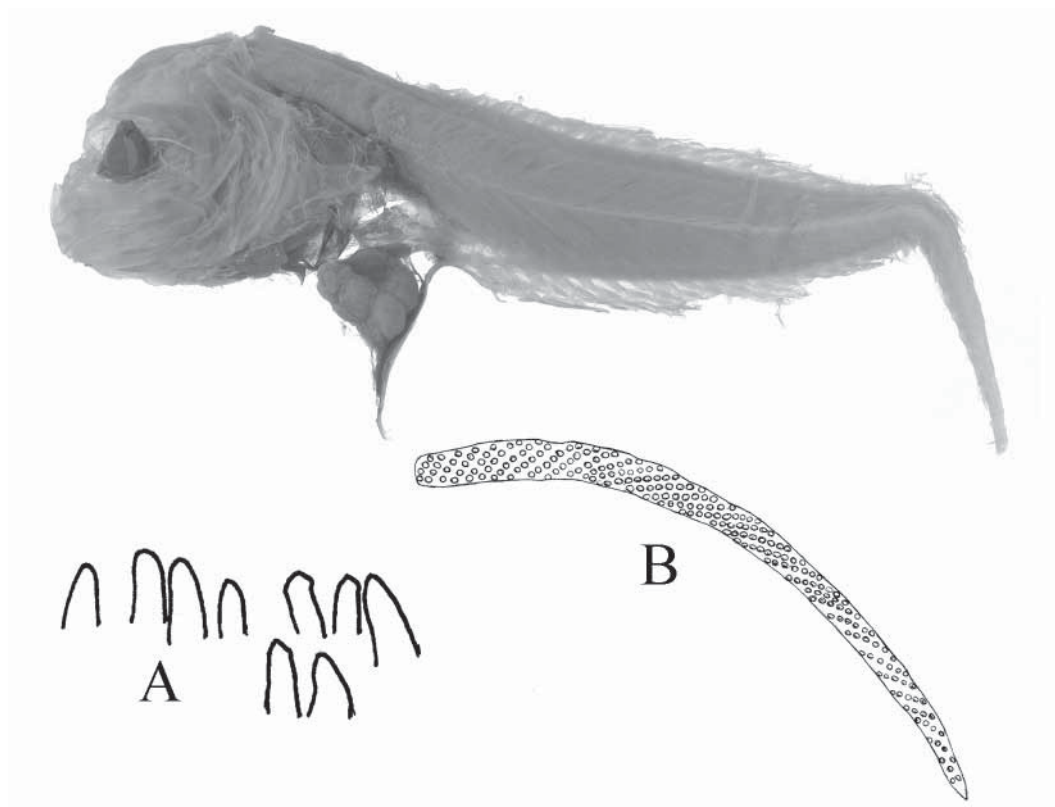
Standard length (SL) is used throughout, unless otherwise indicated. For species of all genera except *Psednos*, we follow the methods described by Stein (1978) and Stein *et al.* (2001) with the exception that pore nomenclature for the temporal pores of *C. pallidus* follows that for *Notoliparis* in Andriashev (2003); for *Psednos*, we follow Chernova (2001) and Chernova and Stein (2002). Where studied, pectoral-fin girdles were dissected and cleared and stained (Dingerkus & Uhler 1977). Whole specimens were temporarily stained with Cyanine Blue 5R (Saruwatari *et al.* 1997). Osteological nomenclature follows Kido (1988). Specimens were radiographed to provide accurate counts of vertebrae and dorsal-, anal-, and caudal-fin rays. Vertebral counts include the hypural complex. Measurements of predorsal- and preanal-fin lengths were made from radiographs. To avoid damaging the left side of specimens, the right pectoral fin and girdle were removed and cleared and stained; when drawn they were reversed as though they were from the left side. In descriptions of new taxa, proportions and counts of the holotype are given first, followed by those of the paratypes in brackets. Ratios are given as % SL, then as % HL in parentheses. Institutional abbreviations follow Leviton *et al.* (1985), as emended by Leviton and Gibbs (1988).

*Paraliparis skeliphrus* new species

(Fig. 1, Table 1)

*Paraliparis* sp. Stein, Melendez, and Kong 1991

**Holotype:** USNM 307338, female, 71 mm SL, “Anton Bruun” Sta. 61, 34° 09'S, 72° 25.5'W, off Chile, 3 Feb. 1966, deep longline 1400-1475 m.



**FIGURE 1.** *Paraliparis skeliphrus* new species. Holotype, USNM 307338, female, 71 mm SL, 34° 09' S, 72° 25.5' W, 1400-1475 m. A: teeth. B: tooth pattern.

**Diagnosis.** A *Paraliparis* distinguished by the following combination of characters: V 53, mouth horizontal, P 22 (14+4+4), rudimentary rays absent, notch rays distinctly more widely spaced than either upper or lower lobe rays, posterior angle of mouth reaching below or slightly behind rear margin of orbit, directly above anteriormost pectoral fin ray, gill cavity pale.

**Description.** Counts and proportions are given in Table 1.

Head moderately long, much deeper than wide; mouth horizontal, premaxillae extending posteriorly to below rear of eye. Teeth present in both jaws, forming narrow

bands about three teeth wide composed of 30 or more oblique rows of 10 or fewer teeth each. Smaller teeth lanceolate, a few of the largest with small but distinct lateral cusps near tip. A wide notch present where premaxillae meet, clearly separating tooth bands on each side of upper jaw. Gill opening length difficult to determine but apparently completely above pectoral fin; opercle long, slender, its tip pointing horizontally.

**TABLE 1.** Counts and proportions of two new species of *Paraliparis*. Proportions given as % SL (in parentheses % HL). H: holotype; P: paratype.

|                              | <i>P. skeliphrus</i> H | <i>P. carlbondi</i> P | <i>P. carlbondi</i> H | <i>P. carlbondi</i> ? |
|------------------------------|------------------------|-----------------------|-----------------------|-----------------------|
| <u>Counts</u>                | USNM 307338            | USNM 381003           | USNM 381002           | USNM 381004           |
| Length (SL)                  | 71 mm                  | 62mm                  | 110mm                 | 70mm                  |
| Dorsal fin rays              | -                      | 54+                   | ca. 57                | 57                    |
| Anal fin rays                | -                      | 49                    | ca 52                 | 52                    |
| Pectoral fin rays            | 22 (14+4+4)            | 23 (15+4+4)?          | 24/25 (16+4+5)        | 26 (19+2+5)?          |
| Caudal fin rays              | 7?                     | 7?                    | 6                     | ≥4                    |
| Vertebrae                    | 53 (9+44)              | 60 (10+50)            | 64 (10+54)            | 64/5 (10/11+54)       |
| Pyloric caeca                | ≥ 6                    | 6                     | 7                     | >3                    |
| Premax tooth pattern         | 30 rows, ≤10/row       | ~17 rows, ≤7/row      | ~22 rows, ≤8/row      | 17 rows, ≤6/row       |
| Mandibular tooth pattern     | -                      | 20 rows, ≤7-8/row     | 18 rows, ≤8/row       | 22 rows, ≤7/row       |
| <u>Proportions</u> %SL (%HL) | -                      | -                     | -                     | -                     |
| Head length                  | 22.2                   | 21.0                  | 19.0                  | 19.3                  |
| Head width                   | 11.8 (53.2)            | 12.7 (60.8)           | 13.1 (68.9)           | ~12.0 (62.2)          |
| Snout length                 | - -                    | 6.0 (34.4)            | 5.0 (26.3)            | 5.4 (28.1)            |
| Eye diameter                 | 4.2 (19.0)             | 4.0 (20.0)            | 4.0 (21.0)            | 4.0 (20.7)            |
| Orbit diameter               | - -                    | 6.6 (31.5)            | 6.5 (34.4)            | 6.1 (31.8)            |
| Snout-anus                   | 16.5 (74.0)            | 14.5 (69.2)           | 14.7 (77.5)           | 14.7 (76.3)           |
| Mandible-anus                | 14.6 (65.8)            | 12.2 (58.5)           | 11.7 (61.7)           | 11.4 (59.2)           |
| Anus-anal fin                | 15.6 (70.2)            | 19.0 (90.8)           | 23.8 (125.4)          | 24.1 (125.2)          |
| Predorsal length             | - -                    | 23.9 (113.8)          | 25.9 (136.3)          | 23.1 (120.0)          |
| Preanal length               | - -                    | 32.9 (156.9)          | 36.2 (190.4)          | 34.6 (179.2)          |
| Maximum depth                | ~18.9 (117.9)          | 17.6 (83.8)           | 18.4 (97.1)           | - -                   |
| Mand-lowest ray              | - -                    | 10.6 (50.8)           | 7.6 (40.2)            | 7.1 (37.0)            |

Dorsalmost pectoral-fin ray appears to be horizontal with lower margin of orbit; 22 pectoral rays, 14 in upper lobe, 4 in notch, and 4 in lower lobe; upper and lower lobe rays distinctly more closely spaced than those in notch. Upper pectoral lobe broken, but enough remains to show that dorsalmost rays reach almost to anal fin origin or possibly

further posteriorly; these rays could be much longer than those lower on the pectoral girdle. Ventralmost rays (those at symphysis of pectoral girdles) far anterior, directly below rear margin of orbit.

Body elongate, slender; dorsal and anal fin-ray counts unavailable owing to damage. Anus far forward, between lower lobes of pectoral fin, just anterior to a vertical through opercular flap. At least six pyloric caeca present, fat, digitate, but of distinctly unequal lengths. Caudal-fin rays six or seven. No skin remaining. Body color tan, oral cavity dusky, branchial cavity pale, peritoneum dark brown, stomach blackish-brown streaked, pyloric caeca pale.

Specimen is a ripe female with eggs up to 4 mm in diameter.

**Etymology.** The specific epithet, “skeliphrus” from the masculine Greek adjective “dry-looking” because the specimen has clearly dried out at some previous time.

**Distribution.** Off Antofagasta, Chile, where it is apparently benthic or epibenthic.

**Remarks.** Because of its condition, this specimen was described but not named by Stein *et al.* in 1991; given the dearth of new specimens and low probability that more will be collected in the foreseeable future, it is named here. The specimen is in fair condition; apparently at one time it dried out, because it is hard and brittle, preventing thorough examination or counts of some characters, such as the pyloric caeca.

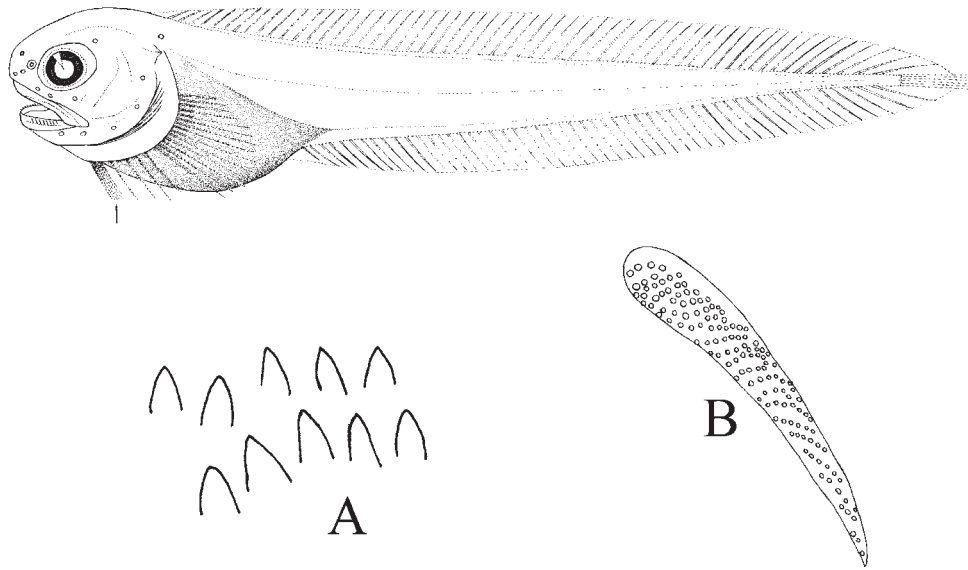
Easily distinguished, *P. skeliphrus* is most similar to *P. fimbriatus* Garman 1892 (from 3241 m in the Gulf of Panama) in counts, tooth shape and arrangement, and some proportions but differs clearly in pectoral fin structure (distinctly wider notch ray spacing vs. all rays similarly and closely spaced) and the position of the pectoral symphysis and anteriormost rays (below rear of orbit vs behind it). The original and the sole subsequent descriptions (Burke 1930) of *P. fimbriatus* are poor, and with the exception of the pectoral girdle, unclear because they are based on total length of the only known specimen, (which is now disintegrated). Garman’s (1899) drawing of the pectoral girdle of the holotype, however, is well done and the arrangement of rays can easily be compared to that in USNM 307338.

The new species differs distinctly from all other *Paraliparis* known from the west coasts of Central and South America in the combination of having a horizontal mouth (vs oblique in *P. debueni* Andriashev 1986, *P. molinai* Stein et al 1991, *P. angustifrons* Garman 1899, and *P. membranaceus*) teeth in bands in both jaws (vs absent or uniserial in one jaw: *P. darwini* Stein & Chernova 2002, *P. galapagosensis* Stein & Chernova 2002, *P. merodontus* Stein et al. 1991) and in the anterior position of the pectoral symphysis (vs distinctly farther posterior: *P. attenuatus* Garman 1899), and in various other characters (most notably number of vertebrae in *P. latifrons* Garman 1899 and in *P. eltanini* Stein & Tompkins 1989).

*Paraliparis carlbondi* new species

(Fig. 2, Table 1)

**Holotype:** USNM 381002, female, 110 mm SL, TL unknown, Anton Bruun Cruise 16, SEPBOB Program, Sta. 650E, 08° 26'S, 80° 36.5' W, off Peru, 8-9 June 1966, deep longline 1830-1930 m. Paratype USNM 381003, female, 62 mm SL, TL unknown, same collection as holotype.



**FIGURE 2.** *Paraliparis carlbondi* new species. Holotype, USNM 381002, female, 110 mm SL, 08° 26' S, 80° 36.5' W, 1830–1930 m. A: teeth. B: tooth pattern.

**Other material.** USNM 381004, female, 70 mm SL, TL unknown, same collection as types.

**Diagnosis.** Distinguished by a combination of characters: 60–64 vertebrae, 24–25 pectoral fin rays, mouth horizontal, teeth simple, forming narrow bands, chin pores with a shallow anterior skin fold, and anus far forward almost between bases of lower pectoral fin lobe rays.

**Description.** Counts and proportions are given in Table 1.

Head short, bluntly rounded, its width about two-thirds its length; snout blunt, sloping almost vertically to upper lip. Mouth horizontal, large, upper jaw extending posteriorly to below or slightly behind rear of eye. Teeth canines, a variety of shapes present in each individual; most moderately stout and sharp, a few of the smallest thorn-like, a few of the largest with tubercular tips. Upper jaw teeth arranged in about 22 [17] oblique rows of 6–8 teeth each, forming a narrow band; innermost teeth largest, graduated in size to outer edge of tooth band. Lower jaw teeth similar in shape, in about 18 [20] rows of 7–8 teeth each, tooth arrangement and numbers similar to that in upper jaw. In upper jaws, a moderately

narrow gap between tooth bands of each side present at symphysis; lower jaw symphyseal gap narrower. Nostrils single, without tubes or thickened rims, about even with or slightly above horizontal through center of eye. Eye about 20 % of head length, orbit not entering dorsal profile of head. Opercular flap unknown; opercle long, slender, its posterior part almost horizontal; gill opening unknown, damaged on both sides. Cephalic pores damaged in both specimens, counts 2-5?-6-1. Chin pores separated by a distance about equal to pore diameter; in holotype, pores round, in a shallow depression with an anterior skin fold present. In paratype, pores oval, depression absent but fold appears to be present.

Pectoral fin upper ray horizontal with or slightly above lower margin of orbit. Rays 24–26, distinctly more widely spaced in notch. Lengths of upper and lower fin lobes unknown. Rudimentary rays absent, notch rays 2–4. Ventral notch ray probably functionally part of lower lobe, but its base distinctly separated from the four or five lowest rays. Symphysis of lower lobes anterior, below eye, interopercle and end of suborbital stay; symphysis of pectoral girdle far forward, below front of eye; anteriormost rays below or forward of corner of mouth and below center of eye. Radials unknown. Fin length unknown.

Body evenly tapering to tail, maximum depth greater than head length. Dorsal origin at sixth or seventh vertebra, anal fin origin at eleventh vertebra. Distance from anus to anal fin origin much greater than head length, increasing with size of individual as a proportion of SL. Abdominal vertebrae clearly distinct from caudal vertebrae; last four or five with short but increasingly long parapophyses; in (smaller) paratype these can be seen in radiographs as unfused. Last abdominal haemal spine much shorter than first caudal one which is very long, almost full length, clearly supporting first anal fin ray. Anus far forward, between bases of lower pectoral fin lobes. A small genital papilla present. Hypurals fused. Pyloric caeca six or seven, probably ventral. Caudal fin rays about six. Skin thin, transparent, easily damaged.

Color of skin on head transparent pale brown with clearly visible closely scattered melanophores, snout darkest; muscles pale, lightly speckled with scattered tiny brown melanophores. Orobranchial cavity dusky, peritoneum dark brown, stomach pale, pyloric caeca pale.

**Additional specimen.** Counts and proportions of USNM 381004 are given in Table 1. This specimen is very similar to the types, but is different enough in several important respects that it is not designated as a paratype. Some of the differences may result from damage, but others are definitely not. In particular, it has a pectoral fin of 26 (19+2+5) rays rather than 24 or 25 (14-16+4+5-6), 22 oblique rows of teeth in the lower jaw rather than 18–20, and the dorsal outline of the abdominal cavity is relatively straight (rather than evenly curved) and seems to extend farther posteriorly. Finally, although the symphysis is slightly damaged, there is no evidence of the chin pores being in a depression or having an anterior skin fold.

**Distribution.** Continental slope off Peru.



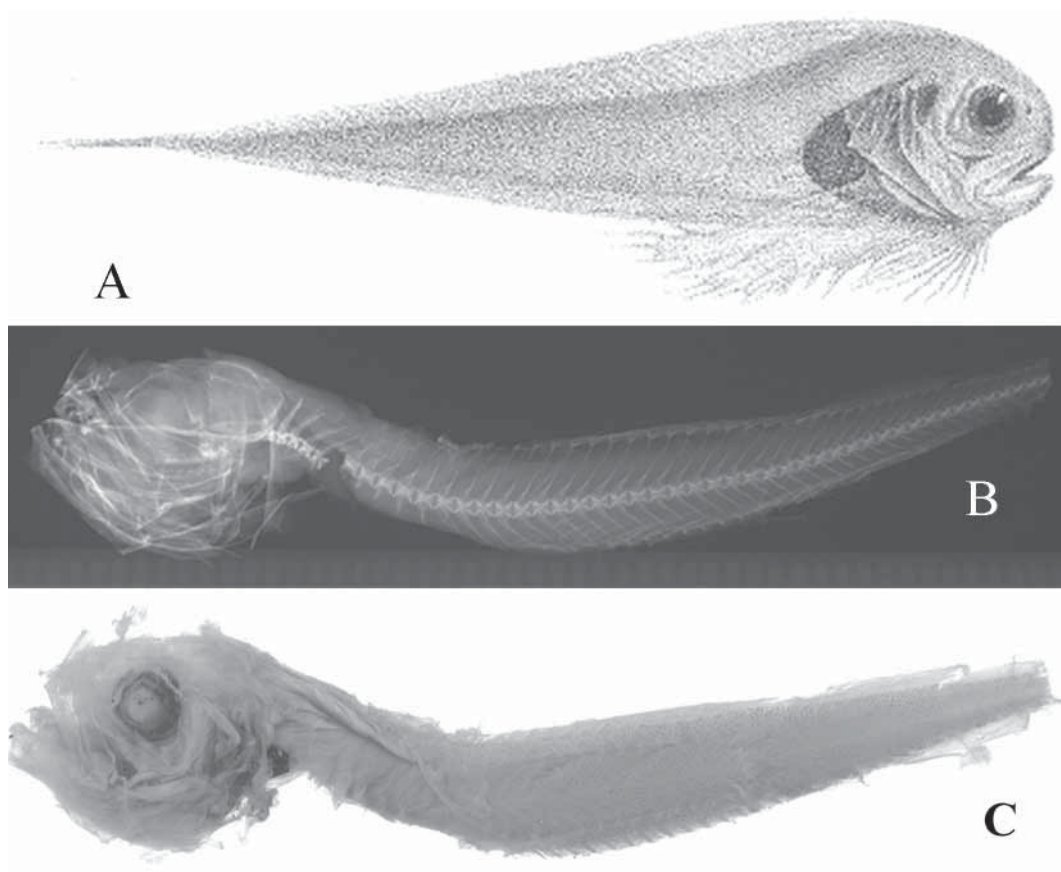
**Etymology.** Named in honor of Carl E. Bond, lifelong student of cottoid fishes.

**Remarks.** In its general appearance, counts, and proportions, the new species is most similar to *P. merodontus*, but differs distinctly, most notably in dentition. It has teeth in both jaws (vs teeth reduced or absent in upper jaw in *P. darwini*, *P. galapagosensis*, and *P. merodontus* and uniserial in *P. attenuatus*), mouth horizontal (vs. oblique in *P. molinai*), and distinctly wider pectoral notch fin ray spacing (vs. all the same in *P. angustifrons* and *P. fimbriatus*). Although the right pectoral girdle was cleared and stained, the apparent absence of calcification of the radials (and consequent non-staining) resulted in their not being visible.

***Paraliparis membranaceus* Günther 1887**

(Fig. 3)

**Material Examined.** **Holotype.** BMNH 1887.12.7.20, 65 mm TL, 57 mm SL, “Challenger” Sta. 310, 51° 27'30" S, 74° 03' W, off Cabo San Vicente, Sarmiento Channel, Chile, 10 January 1876, 738 m. Poor condition.



**FIGURE 3.** *Paraliparis membranaceus* Günther 1887. Holotype, BMNH 1887.12.7.20, ripe male?, 57 mm SL. A: Figure XII D, Günther 1887. B: radiograph. C: photograph.



**Description.** Head short, compressed, its depth about equal to its length; dorsal profile and snout evenly rounded, mouth terminal or subterminal; eye large, 22.4 %, snout a little longer, about 26 % HL. Interorbital space much wider than eye diameter, very convex. Nostrils single, the nares immediately anterior to orbit and on a horizontal through its center; rosette oval, consisting of six pairs of laminae, immediately anterior to anterodorsal quadrant of orbit. Mouth distinctly oblique; upper jaw reaching to below rear margin of orbit, about 44 % HL. Teeth small, thorn-like canines, in about 40 oblique rows forming a narrow band four or fewer teeth wide except posteriorly, where it is uniserial for fewer than 10 rows; symphyseal gap apparently narrow. Mandibular teeth similar in character and arrangement. Suborbital stay long, slender, pointing posteroventrally at an angle of about 30°. Opercular flap short; gill opening short, entirely above pectoral fin.

Pectoral fin of about 25 rays (17+8), uppermost ray even with or slightly below rear corner of maxilla; symphysis far forward, below or in front of anterior margin of orbit. Upper lobe much longer than head, 134.3 %, lower lobe shorter, 78.3 % HL. Lower lobe rays eight, notch ray spacing apparently not distinctly wider, not clearly separated from more dorsal rays. All rays long, emarginate, providing appearance of a fringe along fin edge.

Body compressed, relatively deep, deepest point about at occiput, about equal to head length; tapering evenly to caudal from a point behind the abdominal cavity, where dorsal fin is deepest. Vertebrae more than 45. Skin folds of both dorsal and anal fins extending anteriorly. Abdominal cavity short, anus far forward between lower pectoral fin lobes, below rear or center of orbit. Dorsal fin origin above opercular flap, anal fin origin apparently far forward. Caudal fin of two to three fine, long, rays, tapering to a point.

Skin transparent, heavily dotted with small melanophores, especially on dorsal and anal fins. Muscles pale. Oral cavity paler anteriorly, more thickly dotted with melanophores posteriorly; gill cavity dark, pigment visible through membranes of branchiostegal rays. Tongue closely dotted with melanophores on its dorsal surface but not ventrally. Peritoneum dark brown, visible through body wall; stomach dark brown, pyloric caeca pale.

**Remarks.** *Paraliparis membranaceus* is similar in many important characters to *P. molinai* Stein *et al.* 1991, collected off Chile at similar depths but farther north. These include an oblique mouth, number of pectoral fin rays (25 and 24), ventral position of the pectoral fin (dorsal ray even with or below posterior corner of maxilla, symphysis far forward below the eye), and reduced caudal fin (4 rays in *P. molinai*, 2–3 in *P. membranaceus*). However, *P. membranaceus* differs significantly in some key characters: it has premaxillary teeth in short oblique rows forming a narrow band (vs. biserial), lacks a noticeable gap between the rays of the upper and lower pectoral fin lobes (vs. distinctly wider spacing of the three notch rays), the stomach is dark brown (vs. pale yellow), and the oral cavity is heavily dotted on a pale background (vs. dark brown). In the unlikely event that these differences are size-related, it could be a senior synonym of *P. molinai*.

This species has been recorded only once, and I could find no evidence of any subsequent reexamination in the literature. Although the actual collection information is obscure but unequivocal (Murray, 1895), Günther's (1887) description omitted to say it was from Chile ("... off Cape St. Vincent, Station 310 ..."). Subsequently, no one sought the actual collection data, and even the Natural History Museum on-line catalogue included incorrect collection data (subsequently corrected). Lindberg (1973) misinterpreted "Cape St. Vincent" to mean "off Portugal", the location of the best known geographic feature of that name. Stein and Able (1986) followed Lindberg; thus Stein *et al.* (1991) omitted it from their review of Chilean liparids, and Andriashev (2003) did not include it in his review of Southern Ocean species. However, in the course of preparing an account of liparids of the East-Central Atlantic, when collection data for the specimen was obtained, Lindberg's erroneous assumption became obvious; the specimen is clearly from fiord waters of southern Chile.

Günther's description provides relatively little information, but his figure is excellent, appears to be exceptionally precise, and is stated to be "of the natural size". The specimen length was given as "2 1/4 inches long" (e.g., 57 mm), and the drawing total length is 65 mm (the end of the caudal peduncle is not shown), so it seems that 2 1/4 inches was the standard length and total length of the specimen was 65 mm. Thus, some measurements and the pectoral fin-ray counts used here were taken directly from the drawing. There is one apparent error in the description, which states "pectoral fin very large, with a very broad base, extending from the upper end of the gill-opening forward ..." but this is unlikely to be correct because almost all known liparids have the gill opening starting above the pectoral fin. I suggest that Günther meant "lower" rather than upper, indicating that the gill opening was short and completely above the pectoral fin.

Although at the time of its description, the holotype was clearly in excellent condition (Fig. 3A), it is now in poor condition, fragile, and will probably disintegrate in the near future (Fig. 3B, C). It is missing the caudal fin, hypural complex, the abdominal walls, most of the internal organs and skin, and has badly damaged pectoral fins and jaws. The redescription is a combination of Günther's description, data from his figure, and from my own examination of the specimen.

### ***Paraliparis merodontus* Stein, Melendez, and Kong 1991**

**Material examined.** SIO 72-155, five specimens: male?, 112 mm SL, 125 mm TL; female, 137, 154; male, 137, 151; female, 141, 157; male, 144, 158; FVSL trap MV 72-I-5, 25° 21' S, 70° 45' W, off Chile, 12-13 April 1972, 1052 m; SOSC 289, male?, 177 mm SL, TL?, "Anton Bruun" Cruise 16 Sta. 650E, 08° 26'S, 80° 36.5' W, deep longline off Trujillo, Peru, 8-9 June 1966, 1830-1930 m.

**Description.** This species was described from a series of individuals of lengths from 161 to 207 mm SL, significantly larger than three of the specimens above. Examination of

the smaller individuals verifies the accuracy of the original descriptions even when applied to individuals not within the original size range. With four exceptions, all characters (both counts and proportions) fall within the ranges displayed by the types. The exceptions are distance from snout to anus (14.8–16.6 vs. 11.7–14.4 % SL), distance from anus to anal fin origin (16.6–19.2 vs. 19.4–24.4 % SL), horizontal diameter of orbit (4.0–5.7 vs. 3.2–4.3 % SL), and presence of premaxillary teeth. The smaller specimens have a few tiny teeth occurring irregularly near the symphysis of the premaxillae, although these are absent in the largest specimen. In addition, although the original description did not mention them, pleural ribs are present. The new specimens significantly extend the geographic and bathymetric range of the species.

**Distribution.** *Paraliparis merodontus* is known from off northern Peru to at least north-central Chile at depths between 700 and 1930 m.

### Genus *Notoliparis* Andriashev 1975

#### *Notoliparis antonbruuni* new species

(Fig. 4)

**Holotype:** SIO 65-610, female, >117 mm SL, “Anton Bruun” Sta. (524B)3, ca. 12° S, 79° W, ca. 120 n.mi.W of Callao, Peru, 24 Nov. 1965, 6150 m. Poor condition, in three pieces.

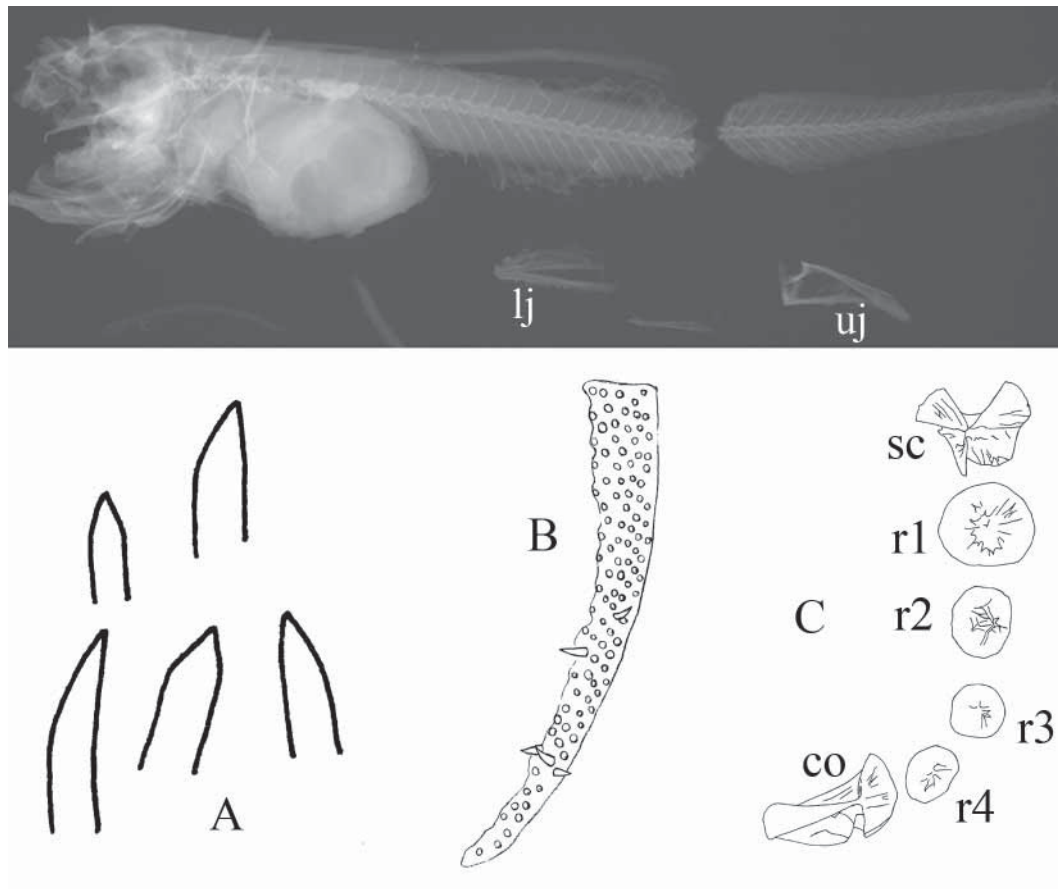
**Diagnosis.** A *Notoliparis* with 29 pectoral-fin rays, 59 or more vertebrae, eye 1.8 % SL or more, and anus less than disk diameter distant from disk.

**Description.** Counts: V>59 (12+?47), P 29 (22+2+5), C 9 (4/4+1). Ratios: eye  $\geq 1.8$  SL, disk-anus in disk  $> 1.3$ , disk in anus-A  $< 1.8$ .

Head badly damaged, unmeasurable. Eye tiny, lens almost as large as entire eyeball. Nostrils unknown. Premaxillary teeth long, slender, sharp, slightly recurved canines in about 28 oblique rows of up to 5 or 6 teeth each, forming a narrow band, up to 4 teeth wide at symphysis but almost uniserial posteriorly. Mandibular teeth similar in shape and arrangement, but in about 23 rows of up to 4 teeth each. Innermost teeth largest, outermost moderately large. Cephalic canals and pores and gill openings missing.

Pectoral fin rays probably 29 (22+2+5), wider in notch but not clearly distinct from upper and lower lobes; rudimentary rays absent. Left pectoral girdle badly damaged, removed for clearing and staining; scapula broad, coracoid with well-developed shaft. Four large, round, poorly calcified radials present (1+1+1+1), dorsalmost largest, notches and foramina absent. Body relatively deep. Pleural ribs absent. Disk well-developed, only its skeleton remaining; estimated diameter without margin 1.3 distance from it to anus. Abdominal vertebrae lacking elongate parapophyses and haemal spines; first caudal vertebra with complete haemal spine. Pleural ribs absent. Hypurals completely fused, (presumed) lower half better developed than the upper. Peritoneum pale, stomach dusky.

The specimen has ripe eggs of about 7.5 mm diameter.



**FIGURE 4.** *Notoliparis antonbruuni* new species. Radiograph of holotype, SIO 65-610, female, >117 mm SL, ca. 12° S, 79° W, 6150 m. lj: lower jaw; uj: upper jaw. A: teeth. B: tooth pattern. C: reconstructed left pectoral girdle. co: coracoid; sc: scapula; r1-4: radials.

**Distribution.** Known only from the single specimen taken at hadal depths off Callao, Peru.

**Etymology.** Named after the R/V “Anton Bruun,” which collected the specimens of the new taxa described in this paper and whose cruises added significantly to knowledge of the South American deep-sea fish fauna.

**Remarks.** Although this specimen clearly represents a previously unknown species, the extensive damage to it means it is impossible to determine its genus with certainty; it could be in *Careproctus*, *Notoliparis*, or *Pseudoliparis*. The specimen is so fragile that during clearing and staining, the pectoral girdle disintegrated, but not before the positions of the radials could be determined; Fig. 4C shows the scapula, radials, and coracoid, in their correct (reconstructed) positions. In many respects it is similar to *C. sandwichensis* Andriashev and Stein 1998 from 5450 m in the South Sandwich Trench, but it is notably different in pectoral fin structure (two or three notch rays, widely separated, vs all rays equally spaced; all radials round vs “rounded squares”; dorsal radial (1) largest, others

equal size vs 1 largest, gradually smaller ventrally), premaxillary tooth number and pattern (ca 28 vs. about 8 oblique rows), eye size (56 vs. 48 times in SL), caudal rays (9 rays, 1+4/4 vs. 11 1+5/3+2), and distance from anus to anal fin origin (ca. 9 vs. ca. 13 % SL). Both *Notoliparis* and *Pseudoliparis* are distinguished from other liparid genera particularly by the structure of the cephalic canals (presence of a coronal pores and blind canaliculi), but also in absence of pleural ribs, having rounded pectoral radials without notches or fenestrae, reduced eyes, and lack of pigmentation (Andriashev, 1975; Andriashev & Pitruk, 1993). The significant distinctions between the two are primarily differences in the structure of the cephalic canal and pore system (which unfortunately cannot be determined in this specimen). The new specimen fits all the other generic characters, notably pectoral girdle structure, extremely small eye, absence of pleural ribs, and number of caudal fin rays. *Pseudoliparis* species (two) are known only from trenches in the North Pacific, and those of *Notoliparis* (three) are known only from South Pacific trenches. Based on distribution, it seems most likely that this is a new species of the latter, and therefore it is included in that genus.

*Notoliparis antonbruuni* differs from the other three species of the genus in having large, well-developed radials gradually decreasing in size ventrally (vs small, size otherwise). In number of pectoral rays (29) it is similar to all (31, 31, and 32–33 rays respectively). In number of vertebrae (59) it is most similar to *N. macquariensis* (with 56–58; *N. kurchatovi* has 50, *N. kermadecensis* has 65) but is distinct in having the lowest radial smallest (vs. the third smallest), a smaller eye (55 or more vs. 40–43 times in SL), greater distance from anus to anal fin origin (about 8 vs. more than 10 times in SL), and other characters.

The liparids are one of the most diverse fish families with hadal representatives. *Notoliparis antonbruuni* increases the number of liparid species known from depths below 6000 m to four; the others are *Pseudoliparis amblystomopsis* (Andriashev 1955), *Notoliparis kermadecensis* (Nielsen 1964), and *Pseudoliparis belyaevi* Andriashev and Pitruk 1993. Three more species are known between 5-6000 m (*Careproctus sandwichensis* Andriashev & Stein 1998, *Notoliparis kurchatovi* Andriashev 1975, and *Notoliparis macquariensis* Andriashev 1978).

Although this specimen is in very poor condition (skinned, most of head missing, broken into three pieces), it is nevertheless distinct enough to distinguish from other species and is described herein because it is unlikely that any more individuals will be collected in the foreseeable future.

### **Genus *Careproctus* Krøyer 1862**

#### ***Careproctus pallidus* (Vaillant 1888)**

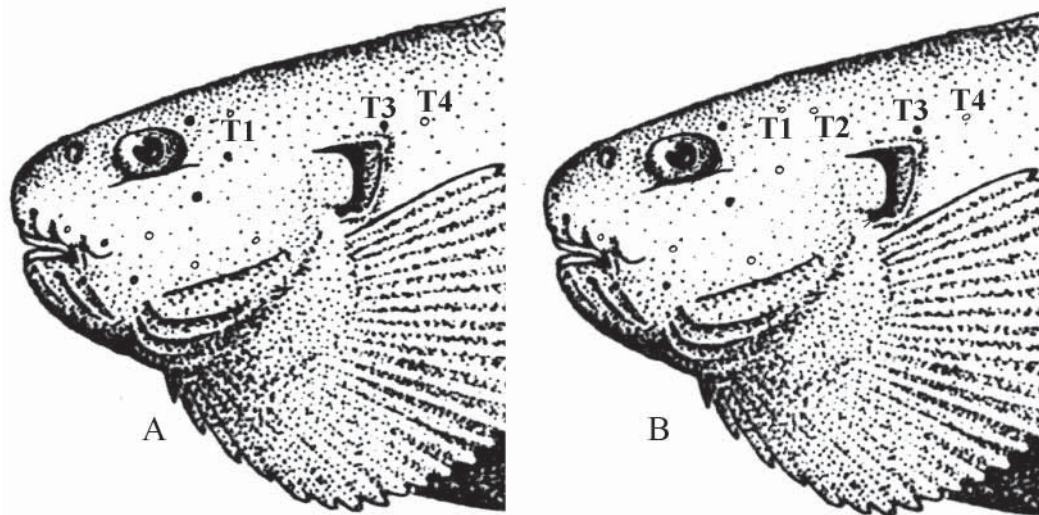
(Fig. 5, Table 2)

*Enantioliparis pallidus* Vaillant 1888: 22, Pl. 4, Figs. 3, 3a, 3b



*Liparis pallidus* Garman 1892: 70  
*Careproctus pallidus* Norman 1937: 130  
*Careproctus crassus* de Buen 1961: 37

**Material Examined.** *Enantioliparis pallidus* (Vaillant 1888).



**FIGURE 5.** *Careproctus pallidus* (Vaillant 1888). Pore patterns in CAS 60515 (corrected) and USNM 347660, modified from Andriashev's (1997) drawing of CAS 60515. A: diagrammatic lateral view of cephalic pore patterns in CAS 60515. B: cephalic pore patterns in USNM 347660. Open pores differ from those in the original drawing; filled pores are the same. T1–T4: post-temporal pores.

**Holotype.** MNHN 1884-841, ripe? male, ~42 mm SL, 55° 31' S, 68° 03' W, Orange Bay, Tierra del Fuego, Chile, 28 m. **Paratype.** MNHN 1884-842, ripe? male, 44 mm SL, collected with holotype.

**Other material.** USNM 347660, ripe male, 41 mm TL, 34 mm SL, USARP Sta. 69-24, 53° 51' 32" S, 70° 25' 52" W, kelp beds on SSE side of Harriss Bay, east coast of Dawson Is., Chile, 18 May 1969, 1.6 - 3 m. *Careproctus crassus* de Buen 1961. **Neotype,** CAS 60515, female, 77 mm TL, 68 mm SL, in *Macrocystis*, Punta Toro, Isla Navarino, Tierra del Fuego, Chile, 15 Jan. 1980, 6-8 m.

**Diagnosis.** Vertebrae 36–37 (10+26–27), D 29–31, P 24?–29, C 12, radials 4 (3+1), round, unnotched. Interneural of first dorsal between vertebrae 5–6 or 6–7. Pectoral fin short, rounded, unnotched, middle rays somewhat more widely spaced but not shortened. Gill opening short, above pectoral fin base. Head length ca 24–30% SL, preanal fin l. 46.8–55.4, disk 38.2–45.9 % HL. Color in life orange, in alcohol, yellowish.



**TABLE 2.** Comparison of meristic and morphometric characters of the four known specimens of *Careproctus pallidus* (Vaillant 1888). H: holotype; P: paratype; N: neotype of *Careproctus crassus*; r: rudimentary ray. All lengths SL. Proportions given as % SL (in parentheses % HL). Figures in [ ] from original description (Vaillant, 1888). Figures in { } from Andriashev (1997).

|                    | USNM 347660<br>34 mm | MNHN 1884-<br>841 (H) 42 mm | MNHN 1884-<br>842 (P) 44 mm | CAS 60515 (N)<br>68 mm |
|--------------------|----------------------|-----------------------------|-----------------------------|------------------------|
| <u>Character</u>   |                      |                             |                             |                        |
| Dorsal fin rays    | 30 (+2 r)            | ca. 31                      | 31                          | 31 (+1 r)              |
| Anal fin rays      | 26                   | ca. 26                      | 25                          | 25                     |
| Pectoral fin rays  | R 28 L 29            | [20 or fewer]               | ca. 24                      | 27                     |
| Caudal fin rays    | 12 (1+5/5+1)         | -                           | -                           | 12 (1+5/5+1)           |
| Vertebrae          | 37 (9+28)            | 37 (10+27)                  | 37 (9+28)                   | 36 (10+26)             |
| Head l.            | 30.0                 | [23.8]                      | 25.2                        | 24.2                   |
| Head width         | 30.5 (102.0)         | -                           | ~14.4 (~88.3)               | 19.3 (79.4)            |
| Snout l.           | 10.6 (35.3)          | 8.3 (35)                    | 7.7 (30.6)                  | 9.7 (40.0)             |
| Eye l.             | 4.7 (15.7)           | [4.8 (20)]                  | {3.9 (17.0)}                | 3.7 (15.2)             |
| Orbit l.           | -                    | -                           | 5.7 (22.5)                  | 5.1 (21.2)             |
| Interorbital width | 14.7 (49.0)          | [14.3 (60)]                 | {9.9 (42.4)}                | {9.9 (42.4)}           |
| Gill opening l.    | 5.9 (19.6)           | -                           | {3.5 (15.2)}                | {3.5 (15.2)}           |
| Snout to anus l.   | 30.5 (102.0)         | -                           | -                           | ~29.4 (~121.2)         |
| Chin to anus l.    | 27.4 (91.2)          | -                           | -                           | -                      |
| Chin to disk l.    | 12.0 (40.2)          | -                           | 10.7 (42.3)                 | -                      |
| Disk to anus l.    | 3.2 (10.8)           | -                           | -                           | -                      |
| Disk l.            | 11.5 (38.2)          | [12.6 (53)]                 | 11.6 (45.9)                 | 11.0 (45.4)            |
| Pectoral fin l.    | 18.2 (60.8)          | [20.2 (85)]                 | 15.0 (59.4)                 | 11.5 (47.3)            |
| Lowest ray l.      | 3.8 (12.7)           | -                           | -                           | {3.5}                  |
| Predorsal fin l.   | 36.7 (122.2)         | -                           | 35.9 (142.3)                | 34.6 (142.4)           |
| Preanal fin l.     | 49.2 (164.0)         | -                           | 46.8 (185.6)                | 55.4 (228.5)           |
| Body depth         | 29.4 (98.0)          | [30.9 (130)]                | {32.4}                      | 36.4 (150.3)           |

**Description.** Because Andriashev (1997) described and discussed this species, only additions and modifications to his account are provided herein.

Nostril diameter about equal to its length (vs. “its diameter 1.5 times in its length”). Opercular flap small, clearly lobed; a tissue fold extends ventrally as far as disk, appearing as though gill opening extends down entire side of body, but it does not. When opercular flap is closed, dorsal end of opening forms a membranous tube that remains open. Gill opening slightly larger than eye diameter. Cephalic pores small or tiny, easily overlooked,

none tubular. Pore pattern 2-6-7-(+ 3-4 temporal pores). First temporal pore ( $t_1$ ) is sixth and last of infraorbital series;  $t_3$  and  $t_4$  are suprabranchial. Pores  $t_1$  and  $t_{3-4}$  apparently always present, presence of  $t_2$  variable. Chin pore pair spacing about equal to that of other pores (vs. “notably converged”). Orobranchial cavity and stomach pale.

**Remarks.** Specimen USNM 347660 was perfect before being cut open for internal examination. There was no damage to the skin or appendages whatsoever, and consequently presence or absence of the cephalic pores could be determined definitively. Their small size made it impossible to inject either liquid or air to clarify the canals, but there is no question regarding their presence and apparently irregular occurrence. Because dissection was not necessary for identification, to minimize damage pyloric caeca were not counted, nor was a fin removed for clearing and staining.

*Careproctus pallidus* is highly distinctive among Southern Hemisphere species because it is “Liparis-like” in general appearance, having a stout body with well-developed pectoral and caudal fins, short dorsal and anal fins, and living in shallow waters. In addition, its transverse genital fold and protruding papilla are unique. However, as Andriashev (1997) pointed out, its appearance is deceptive because unlike *Liparis* species, “Pectoral radialis in the specimen CAS 60515 are rounded (without notches), interradsial fenestrae and pleural ribs are reduced, and hypural plates are completely fused and have no traces of a cleft.” Andriashev’s (1997) figure includes some differences from USNM 347660 and some inaccuracies, particularly of pores. It shows many, but not all, of the cephalic pores, and portrays some pores not present on the specimen. Some of those shown appear more clearly when the figure is enlarged. For instance, there appears to be a pore immediately posterior to the lower margin of the orbit, and another further back about half an eye diameter, but neither of these is on the specimen. The drawing omits  $io_4$  and  $t_2$ . Furthermore, the opercular flap and the area surrounding it are not as structurally simple as shown.

The temporal pore patterns of the two recently collected specimens differ from each other (Fig. 5) (examination of the types for these characters was inconclusive owing to their condition), but the significance of these differences is unclear. In USNM 347660,  $t_{1-4}$  are present on the right side, but  $t_2$  is apparently absent on the left. In CAS 60515,  $t_1$  is present on both sides, but  $t_2$  could not be found on either side (Fig. 5). Differences between the specimens could easily be the result of size. USNM 347660 is considerably smaller than CAS 60515, and significantly smaller than either of the types (Table 1). Sokolovskii and Sokolovskaya (2003) point out that “all liparid larvae are characterized by the same order of fin formation” this may also be true of other characters (such as pores), but the size at which these characters develop differs among species (Grigor’ev, 2002). Variability in presence of these pores could be related to ontogeny of pore development, but little information is available about such development. Kido and Kitagawa (1986), Matarese *et al.* (1989), Grigor’ev (2002), showed or briefly described pores in liparid larvae or juveniles, but variability of appearance (and disappearance with growth) is

unknown. In any case,  $t_1$  is clearly present on both sides in both specimens. In view of the small number of specimens known (four), it is possible that at small sizes (e.g., less than 40 mm SL), pores exist that later close and disappear. It is also possible that CAS 60515, which is also much larger than the other three specimens, represents a different species. In addition to the four specimens discussed above, Lloris and Rucabado (1991) described five recently hatched individuals 6.3–6.7 mm total length, and Moreno and Jara (1984) listed two more of 4.5–5.0 cm total length. I have been unable to examine any of these latter specimens to verify their identities or the cephalic pore pattern.

If the additional temporal pores normally occur in *C. pallidus*, I believe it would justify recognition of *Enantioliparis* as a valid genus. In that case, the diagnosis of the genus could be: “temporal pores three or four: an anterior (supraorbital) above and just behind orbit, with or without an intermediate about midway between supraorbital and first suprabranchial pores, suprabranchial pores two; coronal and postcoronal pores absent. Genital opening beneath a transverse fold of tissue, a posteriorly-directed genital papilla emerging from beneath it. Pectoral radials rounded, unnotched.”

Possession of the additional temporal pores suggests that *C. pallidus* may provide a shallow water link to the development of the hadal and abyssal liparid genera *Pseudoliparis* Andriashev 1955, *Notoliparis* Andriashev 1975, and *Pseudonotoliparis* Pitruk 1991. All of these have numerous temporal, coronal, and postcoronal pores, considered by Andriashev (1998b) to be plesiomorphic characters similar to the arrangement in other cottoids.

*Liparis antarctica* Putnam 1874 is similar to *C. crassus* in many regards, including unnotched pectoral fin of about 30 rays, pale body and peritoneum color, low number of dorsal and anal fin rays, gill opening above pectoral fin, shape of teeth, and other characters. It differs most notably in having two nostrils, not mentioned by Putnam (1874), but clearly illustrated and described by Garman (1892 Pl. VI, Figs. 8, 10), and in apparently lacking the transverse anal fold (Garman 1892 Pl. VI, Fig. 9) described and shown by Andriashev (1997) and clearly evident in all the specimens listed above.

### ***Careproctus longifilis* Garman 1892**

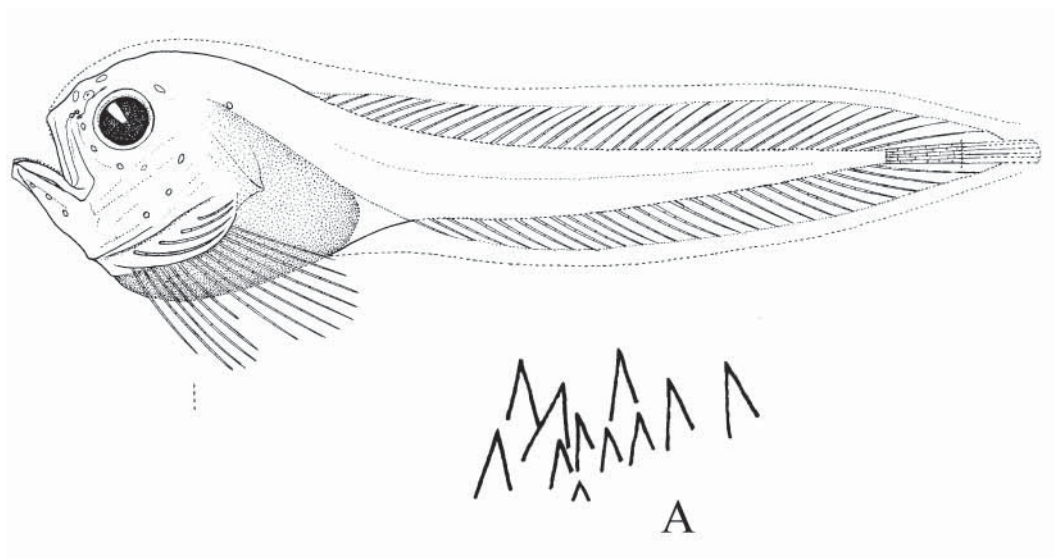
**Material examined.** SIO 72-189, male, 50 mm SL, 55 mm TL, Sta. MV72-II-32, 15° 39.2 S, 76° 13.6' W, Peru (Nazca Ridge), 10–11 May 1972, 8 m otter trawl, ca. 3475 m.

This specimen is small and somewhat damaged, but fits the species description well in all particulars. *Careproctus longifilis* was redescribed by Stein (1978) who described its range as from Panama to Oregon, predicting that “more specimens would be reported from deep water throughout the eastern Pacific Ocean.” This specimen extends the range considerably further south to Peru. The species seems to have an unusually broad range for a snailfish.

Genus *Psednos* Barnard 1927*Psednos carolinae* new species

(Fig. 6)

**Holotype:** USNM 381005, male, 39 mm SL, 45 mm TL, "Anton Bruun" Cruise 6, Sta. 351B #7352, 29° 55' S, 64° 58' E, mid-Indian Ocean, 28 June 1964, midwater trawl 0-350 m.



**FIGURE 6.** *Psednos carolinae* new species. Holotype, USNM 381005, male, 39 mm SL, 29° 55' S, 64° 58' W, 0–350 m. A: teeth.

**Diagnosis.** A *Psednos* with unusually few vertebrae (38), coronal pore present, temporal pores two, mouth angle of about 90° to the horizontal, head length about 30 % of SL, snout to anus distance about 80 % HL, and pectoral fin of 14 (8+1+5) rays.

**Description.** Counts: D 33, A 26, P 14 (8+1+5), C 6, Vert. 38 (10+28), pores 2-5-6-2, coronal present. Proportions: head length 29.1 % SL, head width 17.0 (58.4), depth 28.9 % (99.1 % HL), snout 7.7 (26.5), premaxilla 13.9 (47.8), mandible 13.4 (46.0), eye 7.5 (25.7), gill opening 8.2 (28.3), snout to anus 23.7 (81.4), mandible to anus 24.6 (86.5), anus to anal fin 32.6 (112.4), predorsal length 29.1 (109.7), preanal length 46.6 (160.2), upper pectoral fin lobe 28.3 (97.3), lower pectoral fin lobe 22.2 (76.1).

Head large, its depth about equal to its length, a little more than half as wide as long. Mouth angle about 90° to horizontal, upper jaw slightly longer than lower. Prominent symphyseal knob present on lower jaw, on horizontal with middle of pupil; retroarticular process below front edge of eye. Teeth forming narrow bands in both jaws; upper jaw teeth tiny, mostly biserial, but about 5 oblique rows of about 4 teeth each present near

symphysis. Lower jaw teeth much larger and more numerous than in upper jaw, thorn like, inner teeth slightly larger than outers; forming a narrow band 5 or fewer teeth wide, in either irregular oblique rows or not in rows. Symphyseal gap present in upper and lower jaws. Nostrils single, about on horizontal with upper margin of orbit. Eyes large, about one-fourth of head length. Gill openings completely above pectoral fins, angled strongly posteriorly, tip of the operculum protruding ventrally to form an obtuse angle but not a lobe. Length of opening slightly greater than eye diameter. To avoid damage, gill rakers not examined. Nasal pores 2, posterior pair very large, much closer together than anterior pair or nasal rosettes, above level of orbit, almost on top of head. Coronal pore present, large, on or slightly behind top of head, behind vertical through posterior margin of orbit. Chin pores very widely spaced, one on each side of symphyseal knob and distant from it by at least one pore diameter. Infraorbital pores 5 (anteriormost very small, located on anterior end of suborbital stay), preoperculo-mandibular pores 6, 3 on lower jaw, 3 on cheek. Two temporal pores present; one large, above and to the rear of orbit, one suprabranchial, well above gill opening.

Pectoral fins with 14 (8+1+5) rays, none rudimentary; notch deep, the notch ray distinctly separated widely from upper and lower lobe rays. Dorsal ray even with or below corner of mouth, ventralmost ray anterior, below middle or forward half of branchiostegal rays. Upper lobe longer than lower, of which the rays are free and extended. All rays of similar thickness.

Body moderately humpbacked, depth at occiput about one-fourth SL, depth at anal fin origin less than one-half head depth. Dorsal and anal fins low, overlapping caudal fin by about half. First dorsal ray inserted on fourth vertebra, first anal fin ray on tenth vertebra. Haemal spines of abdominal vertebrae gradually increasing in length posteriorly. Anus far anterior to gill opening, below or behind rear margin of orbit, almost between bases of lower lobe rays; a small blunt genital papilla present. Preanal length slightly less than half SL. Pyloric caeca not examined to minimize damage to specimen. Skin thin, transparent. Hypurals fused. Holotype is a ripe male.

Color of skin translucent white; peritoneum and muscles easily visible through skin. Mouth pale brown, gill cavity darker brown, peritoneum dark brown, stomach brownish.

**Etymology.** Named in honor of Caroline Ajootian, for her unfailing support and encouragement of snailfish research.

**Distribution.** Known only from the holotype taken in mid-Indian Ocean.

**Remarks.** *Psednos carolinae* is most similar to *P. steini* Chernova 2001 in having similar numbers of dorsal and anal fin rays, identical number and arrangement of pectoral fin rays, and many similar proportions, but differs significantly in the following characters: number of vertebrae (38 vs 41), mouth angle (90° vs 50°), longer head (29.1 % vs 24.5 % SL), relatively shorter distance from snout-anus (81.4 % vs 95.6 % HL), more anterior dorsal and anal fin origins (109.7 and 160.2 % vs 118.9 and 177.8 % HL), upper pectoral fin lobe longer than lower lobe (vs shorter), and body color (transparent white vs brown).

*Psednos dentatus* Chernova and Stein 2002 from off Chile is similar in appearance, but lacks a coronal pore and is easily distinguished from the new species by many characters, including numbers of vertebrae, dorsal, and anal fin rays (38 vs 46, 33 vs 39, 26 vs 34). Members of the “Australian” group of species lack a coronal pore and have at least 56 vertebrae.

The new species has the fewest vertebrae known of any in the genus. Chernova (2001) divided *Psednos* into two groups based on number of vertebrae, presence of a coronal pore, and number of infraorbital pores. Subsequently, Chernova and Stein (2002) described ten more species and defined three “natural” groups: the “micrurus” group with vertebrae 40–44, a coronal pore, and postorbital pore absent; the “christinae” group with vertebrae 46–47, a coronal pore absent, and a postorbital pore present; and an “Australian” group with vertebrae 56–58. Chernova and Stein (2004) described another species that fits in group 2. This specimen is in excellent condition, allowing clear conclusions regarding character states. Its few (38) vertebrae and lack of  $io_6$  place it in the “micrurus” group, now including species with 38–44 vertebrae. This is the fourth Indian Ocean species known, all of which have a coronal pore and presumably lack  $io_6$  (whether this pore occurs in *P. micrurus* is unknown).

#### ***Psednos steini* Chernova 2001**

Because the specimen (USNM 200488, subsequently designated as the holotype) had disintegrated, Chernova (2001) described this species using Stein’s (1978) description of it as *Psednos micrurus* Barnard 1927. Unfortunately, Chernova did not have the original data taken from the specimen, nor was she aware of a radiograph of it. Comparison of her redescription with the original counts and measurements indicates that in some respects her description should be modified in accordance with these data.

In particular: the nostril is not level with eye center, but rather above it; the retroarticular angle of the lower jaw is on a vertical anterior to the posterior margin of the eye, not under it; the lower pectoral lobe is longer than the upper, not shorter (UPL 55.5 % HL, 13.6 % SL; LPL 78.9 % HL, 19.3 % SL). The base of the lowermost pectoral fin ray is on a vertical at about half the postocular distance, rather than at 3/4. Vertebrae are 41 (10+31), neither unknown nor 43 as stated, and the specimen definitely had five caudal fin rays.

#### ***Psednos* cf. *dentatus* Chernova and Stein 2002**

**Material examined.** MCZ 146979, male, 65 mm SL, “Anton Bruun” cruise 1302, Sta. 55, 33° 30' S, 72° 15' W, off Valparaíso, Chile, 1680–1960 m, 2 February 1966. Badly damaged, poor condition.



**Description.** Counts: Vert. 48 (11+37), D 42, A 36, P 16 (8+3+5), C at least 5. Proportions: Head ca 22.5 % SL, predorsal length ca 26.9, preanal length ca 36.8, upper jaw length 10.2 (45.2). No other measurements possible.

Head a little more than a fifth of SL, body depth approximately the same. Snout short, blunt. Mouth apparently at an angle of about 50°, dentaries missing. Premaxillary teeth small, sharp, acuminate canines forming a narrow band nowhere wider than four or five teeth. Teeth arranged in very long, irregular oblique rows of up to 9 teeth each, a narrow symphyseal notch present. Nostrils single, possibly on horizontal with upper margin of eye or orbit. Eyes and gill opening unknown. Gill rakers on first branchial arch unmodified. Cephalic pores unknown.

Pectoral fin upper ray apparently on horizontal with corner of mouth, certainly below lower margin of orbit. Upper lobe rays 8, closely spaced; notch rays 3, distinctly spaced from upper and lower lobes, distance between middle, dorsal, and ventral notch rays much greater than between each of them and upper and lower lobes respectively. Lower lobe of 5 rays, approximately below middle of head. Radials unknown.

Body tapering evenly to caudal fin. First dorsal ray inserted between vertebrae X and Y; first anal fin ray between vertebrae A and B. Hypurals fused, overlap of caudal by dorsal and anal fins unknown.

Color of body skin unknown; shreds of brown skin remaining on head. Mouth and branchial cavity dusky, peritoneum dark brown, stomach completely brown.

**Remarks.** This specimen is similar in counts (and the few proportional measurements available) to *Pseudnos dentatus* which was collected from the same region. However, it differs in several significant characters. Whereas the teeth of *P. dentatus* are exceptionally long and arrow-shaped, this specimen has small simple canines; the color of the orobranchial cavity of *P. dentatus* is pale, in this specimen, dusky; and the stomach of *P. dentatus* is dorsally brown but ventrally unpigmented, whereas this specimen has an evenly brown stomach. On the other hand, this specimen is an adult, possibly ripe, male, whereas the holotype of *P. dentatus* is an adult female. These few differences could represent sexually dimorphic characters, but without more specimens it is impossible to verify or reject this hypothesis. Therefore, the specimen will not be named as new here.

## Discussion

As might be expected, distribution and relationships of hadal (greater than 6000 m) and subhadal (5-6000 m) liparids are not well known. These species are widely distributed in both the Northern Hemisphere (*Pseudoliparis amblystomopsis*: Kurile-Kamchatka Trench; *P. belyaevi* Andriashev & Pitruk 1993, Japan Trench) and the Southern Hemisphere (*Careproctus sandwichensis*: S. Sandwich Trench; *Notoliparis kermadecensis*: Kermadec Trench north of New Zealand; *N. kurchatovi*: S. Orkney Trench; *N. macquariensis*, Macquarie Trench south of Australia and New Zealand; and *N. antonbruuni*: Peru-Chile

Trench). It appears likely that each species is limited to a single locality, although the existence of widely dispersed species of a single genus (e.g., *Notoliparis*) suggests that at some time in the past, either a common ancestor lived at shallower depths and had a broader distribution or that the trenches were connected at one time. Andriashev (1978) discussed the distribution of *Notoliparis* species and cited evidence suggesting an ancient connection between “the deep water trenches of the Kermadec-Macquarie-western Antarctica-Chile-Peru regions” which meant that the three species known at that time (now four species) are all in the same trench system. Although the geological connection cited apparently existed in the Permian, and was thus probably much older than the liparids, it is suggestive.

Occurrence of 7.5 mm eggs in *N. antonbruuni* is evidence of the reproductive pattern described by Stein (1980) for abyssal liparids off Oregon, in which instantaneous fecundity is low, reproduction occurs throughout the year, parental care is likely, and direct development (in which individuals lack a larval stage and hatch as juveniles) probable. Without pelagic larvae, there is virtually no opportunity for extending distributions of individual species beyond each trench, thus we should not be surprised to learn that trenches have characteristic liparid species.

Number of species by genus differs on the east and west coasts of South America. On the east coast (including the Falkland Islands but excluding the Strait of Magellan and Drake Passage) deep and relatively deep-water species are dominated by *Careproctus*; of 11 species, nine are *Careproctus* and two are *Paraliparis*; there are no endemic genera known. On the west (including the Galapagos Islands), the 13 species (again excluding the Strait of Magellan and Drake Passage) are in four genera, of which one (*Eknomoliparis*) is endemic. Only three species are *Careproctus*. Of the four species known from the Strait of Magellan and Drake Passage, two are *Careproctus*. This could be a sampling artifact or a reflection of a genuine distributional difference.

With the newly described species, the number of liparid species known from the west coast of continental South America (e.g., south of Panama) increases to about 22 in six genera. Four more species in *Careproctus* and *Paraliparis* are known from off Panama in very deep waters (Garman 1892, 1899); occurrence of one of these (*C. longifilis*) off Peru suggests that others may also occur further south. Thus, it is clear that this coast, similarly to other cold-water regions, has a diverse liparid fauna, not a depauperate one. Likely discovery of more species awaits further exploration of waters of more remote and deeper locations.

### Acknowledgments

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provided specimens for my examination at the museum. Lynn Parenti (USNM) examined the cephalic pores of the types of *C. pallidus*. German Pequeño (Universidad Austral de Chile, Valdivia) and Roberto Melendez (Museo Nacional de Historia Natural, Santiago) found the location of the Chilean Cabo San Vicente, and Oliver Crimmen obtained more collection data for *P. membranaceus*. Whole specimen drawings are by Keiko Hiratsuka Moore, NOAA/NMFS Systematics Laboratory; photographs and radiographs were made by Sandra Raredon, USNM. This work was supported by NOAA's Office of Oceanic and Atmospheric Research and the NOAA/NMFS Systematics Laboratory.

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